

REDWOOD CITY SALTWORKS PROJECT



Outline of Presentation



Presentation of Project Plan



Description of Restoration Plan



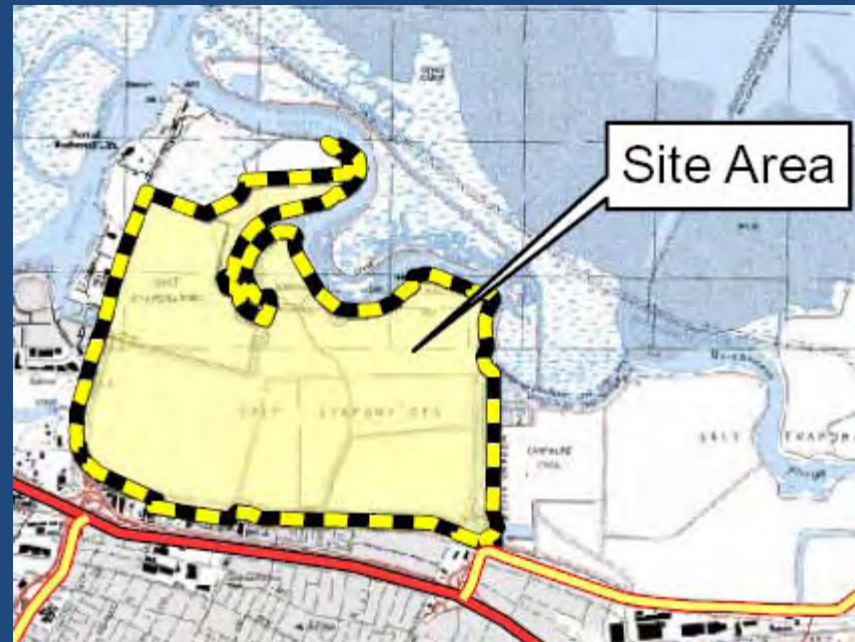
Evaluate level of aquatic resource function provided by proposed project relative to project impacts

Redwood City Saltworks

PROPOSED PROJECT



Active Salt Production Facility located in Redwood City and currently used by Cargill Salt for the production of solar salts

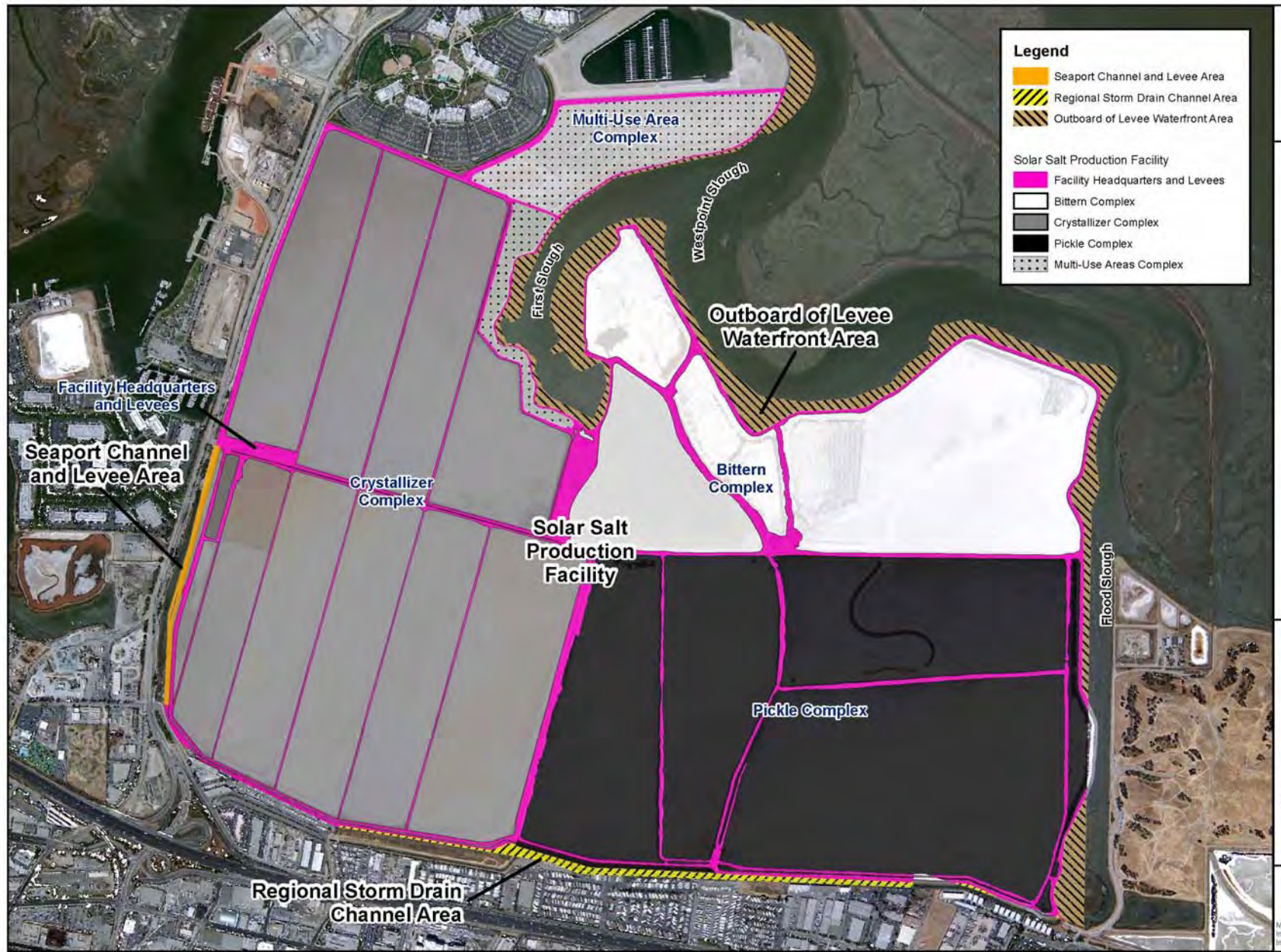




Salt Production Facility

- Last stage in solar salt production
- Receives brines from evaporators
- Crystallized salt harvested and transported to Newark facility
- Comprises 1,362 acres including basins, roads, and industrial facilities





Preliminary Jurisdictional Determination

ACRES				
	PJD Wetland Acreage	Other PJD Presumed Jurisdictional Areas Acreage	Non-PJD facilities and roadways	Total Acreage
Solar Salt Production Facility	0	1,275	87.3	1,362.0
Seaport Channel and Levee Area	0.2	0.5	2.3	3.0
Regional Storm Drain Channel Area	2.5	1.7	3.6	7.8
Outboard of the Levee Waterfront Area	30.6	32.1	0	62.7
Total	33.3	1,309.0	93.2	1,435.5

Project Time Line

- 1901: Salt Production at site location started
- 1940: Department of War Permit issued for levee construction resulting in facility currently in use today for solar salt production
- 2002: Public agencies declined to purchase facility
- 2006: DMB initiates planning for Redwood City Saltworks Project
- 2006: Community involvement and development of 50/50 Balanced Plan
- 2008: Measure W failed to receive local voter approval
- 2009: Submittal of 50/50 Balanced Plan to City in May
- 2010: Approval of PJD by Corps of Engineers in April
- 2010: Publication of Notice of Preparation (NOP) for EIR

Saltworks Project

Existing Conditions



Proposed Project





Map created by the City of San Francisco, Department of Planning and Economic Development, in consultation with the San Francisco Planning Commission. The map is for informational purposes only and does not constitute a legal document. For more information, visit the City of San Francisco's website at <http://www.sfdph.org/dph/cepd/>.

Key Elements of Project

- Transit oriented, walkable community with 12,000 residential units to address scarcity of housing options in Peninsula and greater Silicon Valley
- 50 percent of site is community open space and habitat restoration
- Sustainable community including low impact development design elements
- Schools, public transit, parks, and other amenities included
- Designed to accommodate projected sea level rise and to address regional stormwater issues

Redwood City Saltworks

RESTORATION PLAN ELEMENTS

Saltworks Wetland Restoration Concept Plan

Legend

- Existing Site Conditions
- Proposed Saltworks Development
- Saltworks Property
- Levee Breach
- Tide Gate
- Slough
- Mudflat
- Low Marsh
- Mid Marsh
- High Marsh
- Upland Transition
- Refugia

Approximate Acreages of Marsh Restoration Areas

MARSH TYPE	AREA (acres)
Tidal Marsh Restoration	273
Shoreline Habitat	61
Tidelands Basin	102
TOTAL	436



RESTORATION APPROACH

Blend of:

- Active Restoration Elements

- Fill for high marsh and refugia
- Excavation levee breaches and tidal channel network
- Proposed installation of plant material

- Passive Restoration Elements

- Seed and sediment delivery brought in with restored tidal connection
- Self-organization of mudflat – low marsh - mid-marsh edges

Tidal Marsh Restoration Concept Plan

Legend

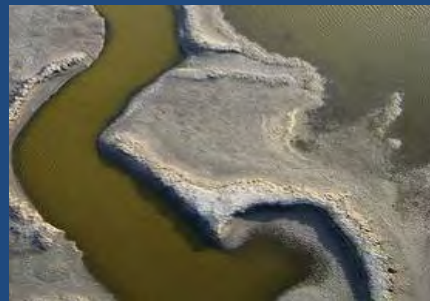
- Existing Site Conditions
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- Saltworks Property
- Levee Breach
- Tide Gate
- Slough
- Mudflat
- Low Marsh
- Mid Marsh
- High Marsh
- Refugia

Tidal Marsh Restoration Approximate Acreages of Habitat Types

Zone Type	Area (Acres)
Refugia	17
High Marsh	52
Mid Marsh	101
Low Marsh	46
Mudflats & Tidal Slough	57
Total Area	273



Extensive Tidal Marsh Habitat Restoration



Shoreline Habitat Concept Plan

Legend

- Existing Site Conditions
- Proposed Saltworks Development
- Saltworks Property
- Levee Breach
- Tide Gate
- Slough
- Mudflat
- Low Marsh
- Mid Marsh
- High Marsh
- Upland Transition

Shoreline Habitat Approximate Acreages of Habitat Types

Zone Type	Area (Acres)
Upland Transition	11
High Marsh	9
Mid Marsh	12
Low Marsh	7
Mudflats & Tidal Slough	22
Total Area	61



Shoreline Habitat Area



Tidelands Basin Concept Plan

Legend

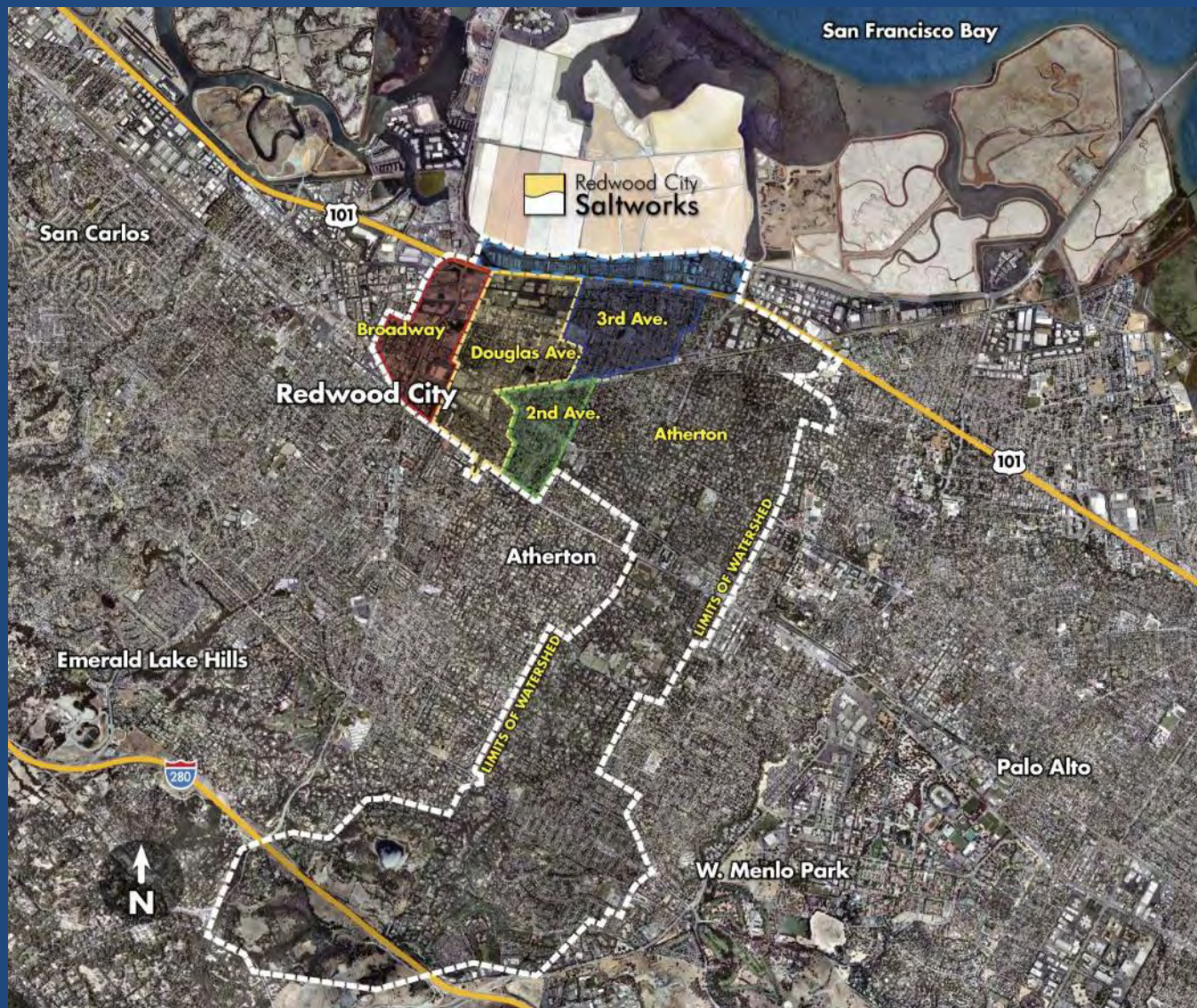
- Existing Site Conditions
- Proposed Saltworks Development
- ▭ Saltworks Property
- ↔ Levee Breach
- ↔ Tide Gate
- Slough
- Mudflat
- Low Marsh
- Mid Marsh
- High Marsh
- Upland Transition

Tidelands Basin Approximate Acreages of Habitat Types

Zone Type	Area (Acres)
Upland Transition	10
High Marsh	7
Mid Marsh	8
Low Marsh	32
Mudflats & Tidal Slough	45
Total Area	102



Bay front Channel Watershed



Seasonal Flooding



Proposed Bay Trail Extension

- EXISTING BAY TRAIL
- POTENTIAL BAY TRAIL EXTENSIONS
- FUTURE SALTWORKS BAY TRAIL
- FUTURE SALTWORKS GREENWAY TRAILS
- FUTURE SALTWORKS CENTRAL BIKEWAY

Trails Plan



Regional Bay Trail



Redwood City Bayside Park



Reconnecting to the Bay



Redwood City Saltworks

AQUATIC FUNCTIONAL ANALYSIS

Corps Compensatory Mitigation Regulations (33CFR332)

“The district engineer must determine the compensatory mitigation to be required in a DA permit, based on what is practicable and capable of compensating for the **aquatic resource functions** that will be lost as a result of the permitted activity” (Sec 332.3(a)(1))

“In cases where appropriate **functional or condition** assessment methods or other suitable metrics are available, these methods should be used where practicable to determine how much compensatory mitigation is required” (Sec 332.3(a)(3)(f))

“Credit means a unit of measure (e.g., a functional or areal measure or other suitable metric) representing the accrual or **attainment of aquatic functions at a compensatory mitigation site**” (Section 230.92)

“The number of credits must reflect the difference between **pre- and post- compensatory mitigation project site conditions**, as determined by a functional or condition assessment or other suitable metric” (Section 332.8(o)(3))

Functional Assessment of Aquatic Functions

- Functional Assessment Methodology
 - Provides means for objective and quantitative assessment
 - Multiple methodologies improve reliability of predictive outcomes
 - WET, HGM, and EPW evaluate multiple functions
 - Assessment is for out-of-kind mitigation
 - Functional capacity determined for pre and post conditions as required by Mitigation Rule
 - Mitigation is tidal/muted tidal wetland
 - CRAM not a functional assessment; only condition
- Provides reliable means to address habitat replacement under CEQA and Corps Mitigation Rule

Functional Assessment of Aquatic Resources

Acronym	Name	Sponsor	Basis for Selection
WET	Wetland Evaluation Technique	EPA	Evaluates a number of aquatic resource functions that can be applied to existing and proposed site conditions
HGM	Hydro-geomorphic Method	Corps of Engineers	Officially accepted methodology by Corps of Engineers; used Tidal Habitat Guidebook developed by Corps
EPW	Evaluation for Planned Wetlands	EPA	Funded by EPA to provide quantitative assessment for mitigation sites.

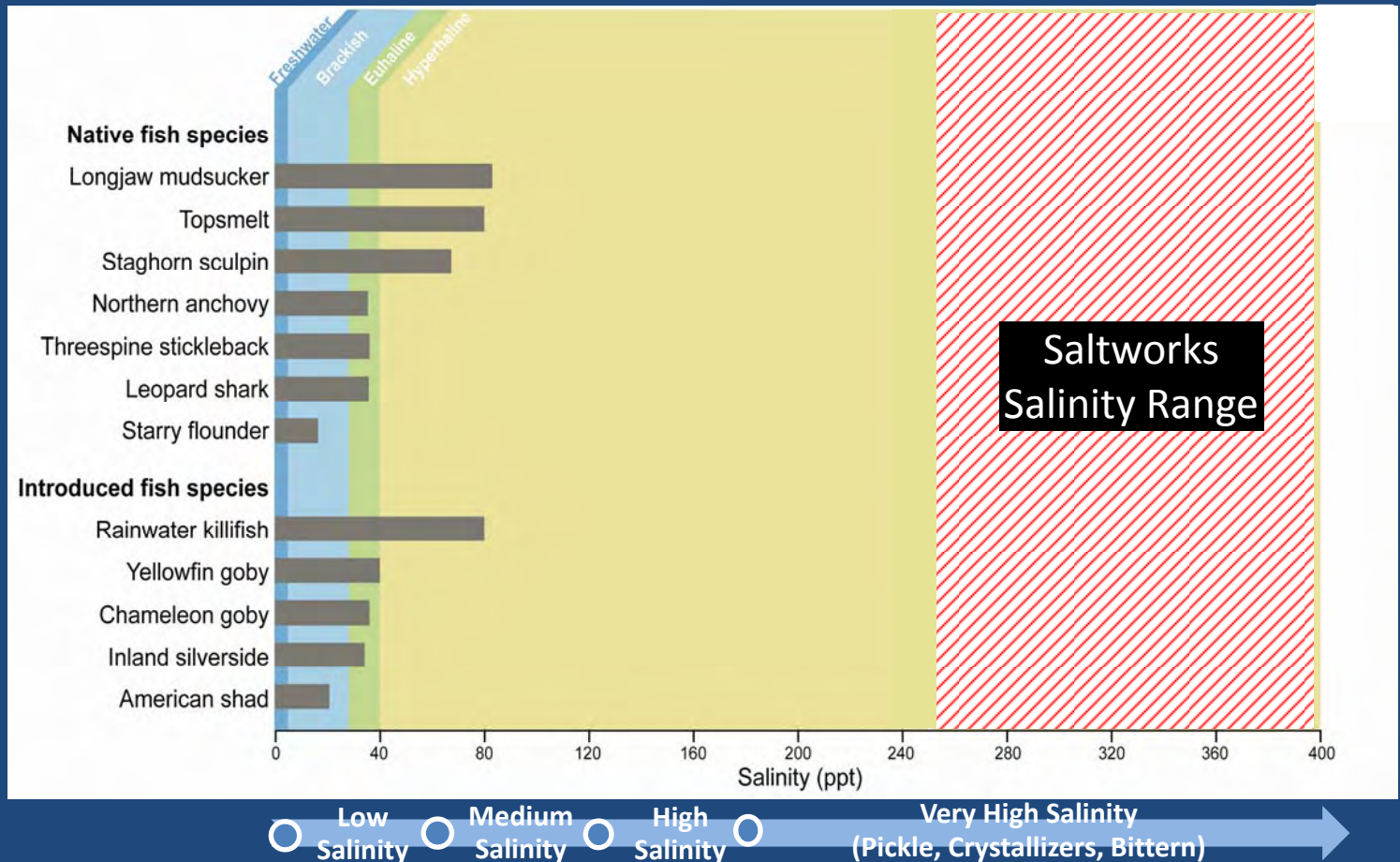
Functional Assessment of Aquatic Resources

- Utilized scientific information collected in San Francisco Bay (including information on salt evaporators as comparison)
 - Focus on bird use as this was only wildlife use at RCSW Salt Production Complex
- Focused on Aquatic Resource Functions in Salt Production Complex
 - Tidal fringe habitat will be avoided in restoration design
 - Seaport Blvd and Regional Storm Drainage Area will have separate assessment

Background Studies

Salinity Tolerances of Fishes in San Francisco Bay Evaporators

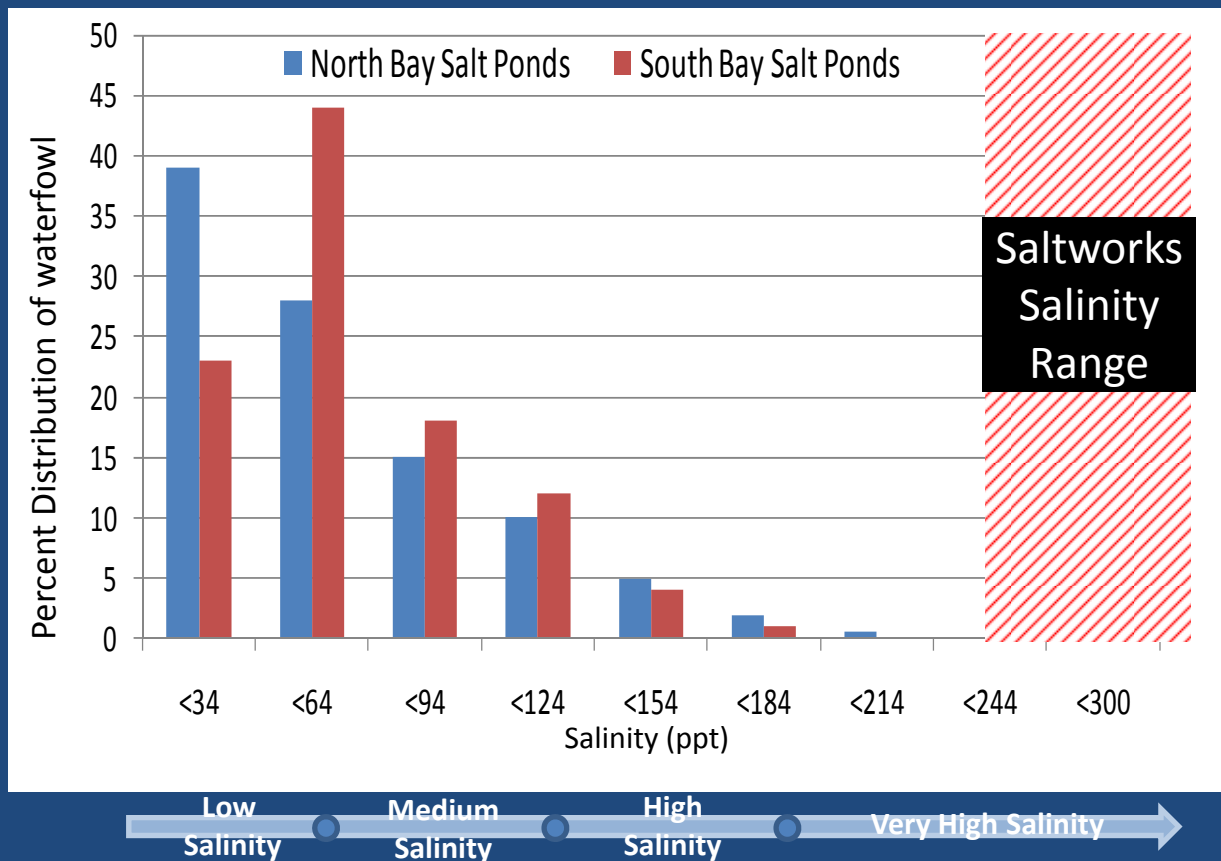
(from Moyle 2002, URS 2008, Froese & Pauly 2010)



Background Studies

Wildlife Diversity/Abundance
Fish
Birds

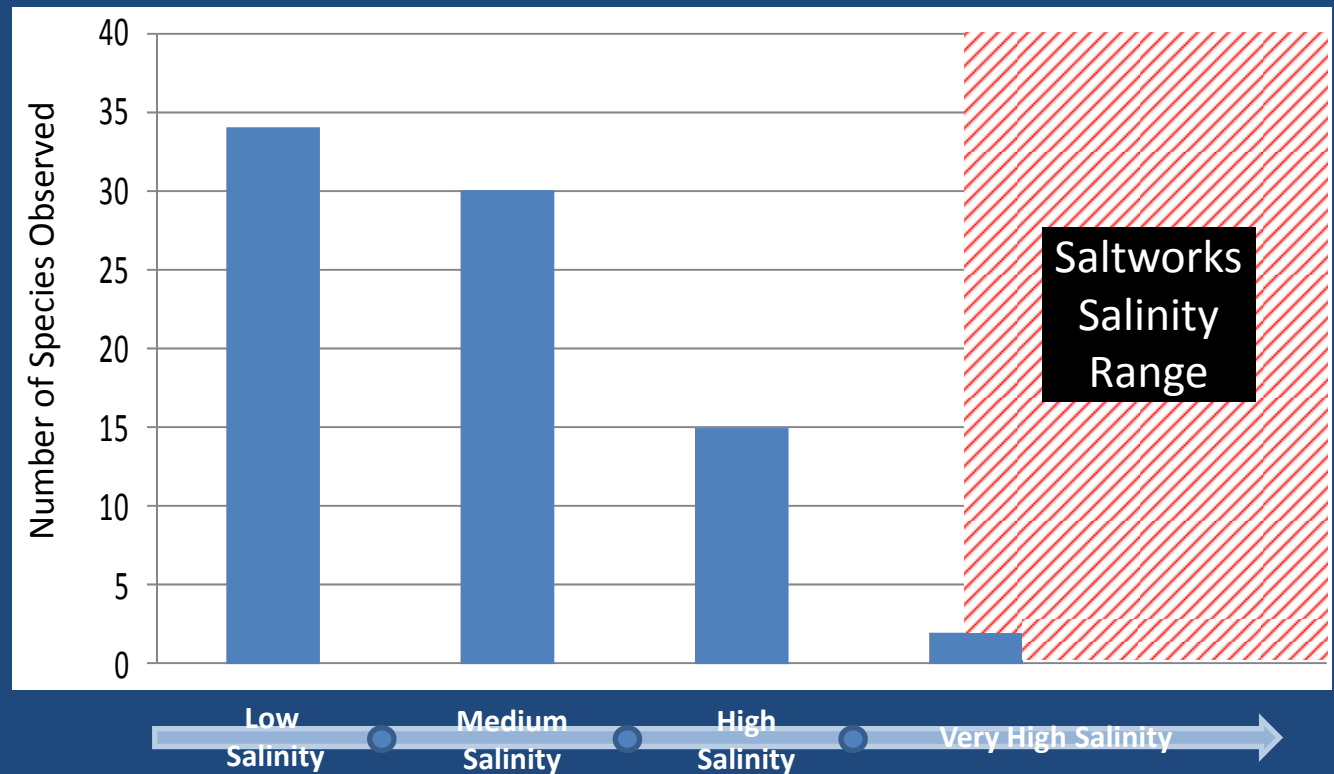
Waterfowl Distribution in S.F. Bay Salt Evaporators: Strong Negative Association with Salinity (from Accurso 1992)



Background Studies

Wildlife Diversity/Abundance
Fish
Birds

Avian Species Richness in Evaporators Decrease at High Salinity (from Stralberg et. al. 2003)



Salt Production Facility

Most Functions and Services are not Present in Salt Production Facility

- No wetland vegetation
- Extreme salinities
- No aquatic organisms
- Variable brine levels
- Industrial production and heavy equipment
- No connection to Bay tidal environment



Salt Production Facility

Wildlife Diversity/Abundance

Birds

Fish

Mammals

Reptiles

Amphibians

Invertebrates

Waterbird Observations at Saltworks

- Salt production facility surveyed once to twice per month over year long period during high tides
- Used same methods as SFBBO study of Newark Evaporators (2005-2009)
- Waterbirds enumerated and identified to lowest taxonomic level feasible



Salt Production Facility

Waterbird Observations at Saltworks by Site Complex



Wildlife Diversity/Abundance

Birds

Fish

Mammals

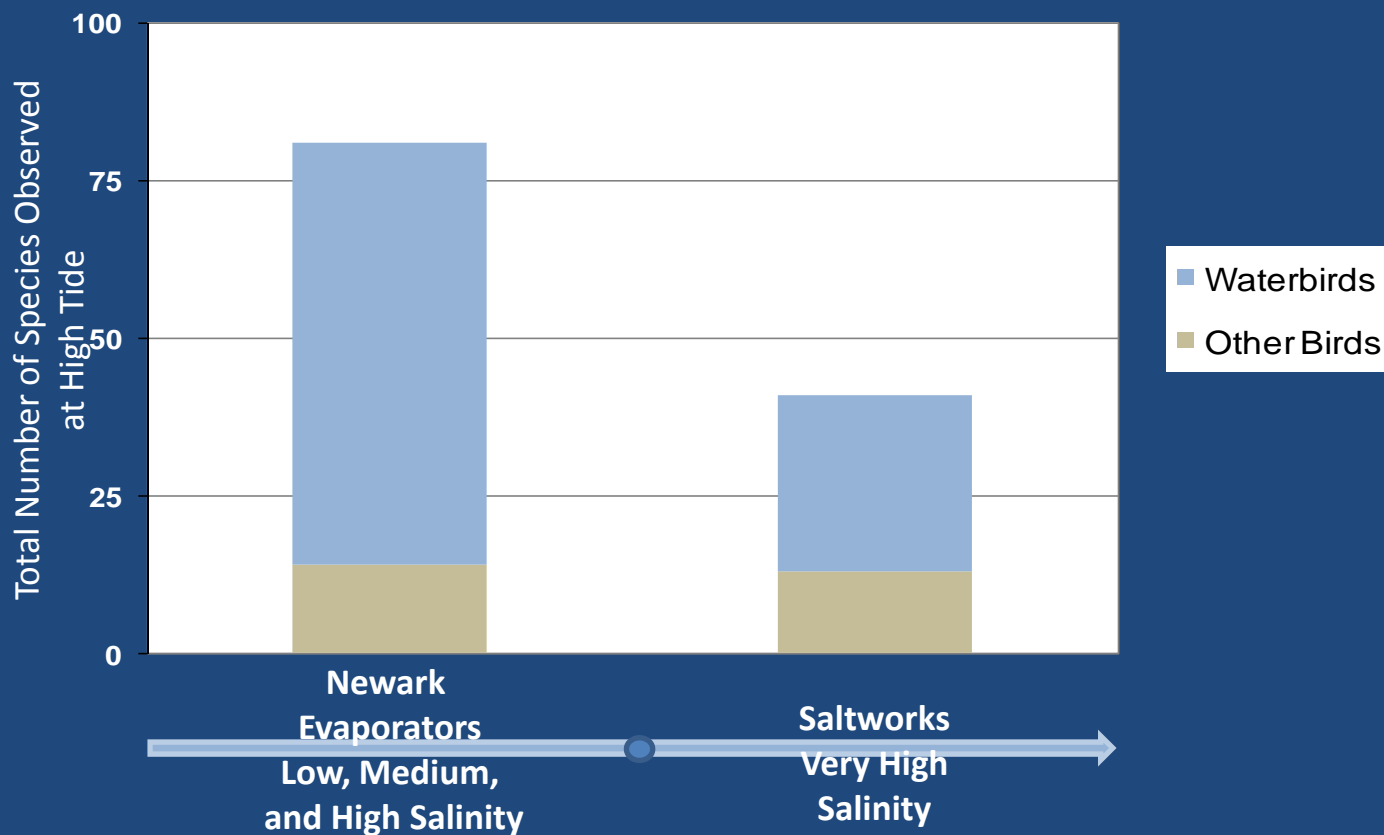
Reptiles

Amphibians

Invertebrates

Salt Production Facility

Species Richness (Number of Species)



Salt Production Facility

Wildlife Diversity/Abundance

Birds

Fish

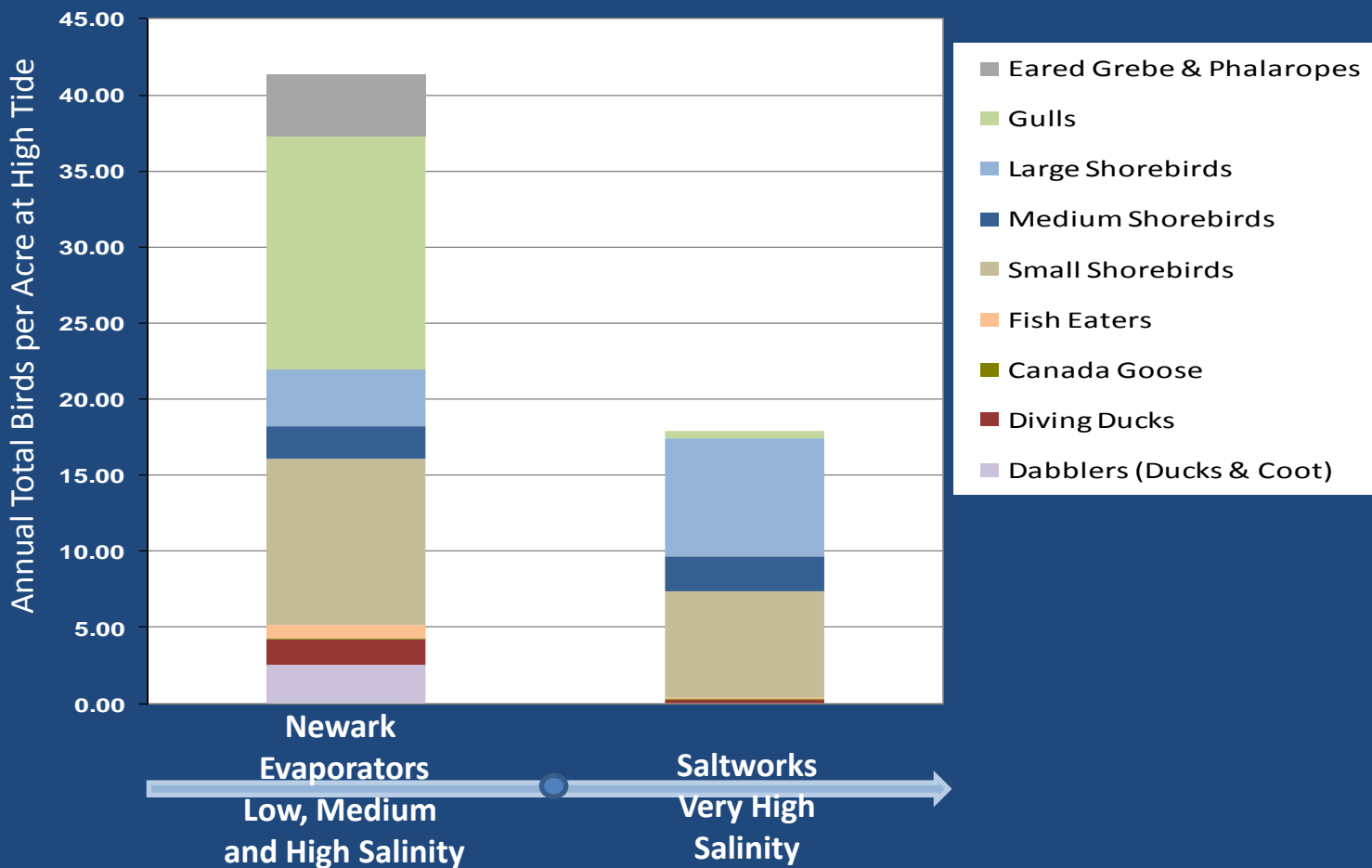
Mammals

Reptiles

Amphibians

Invertebrates

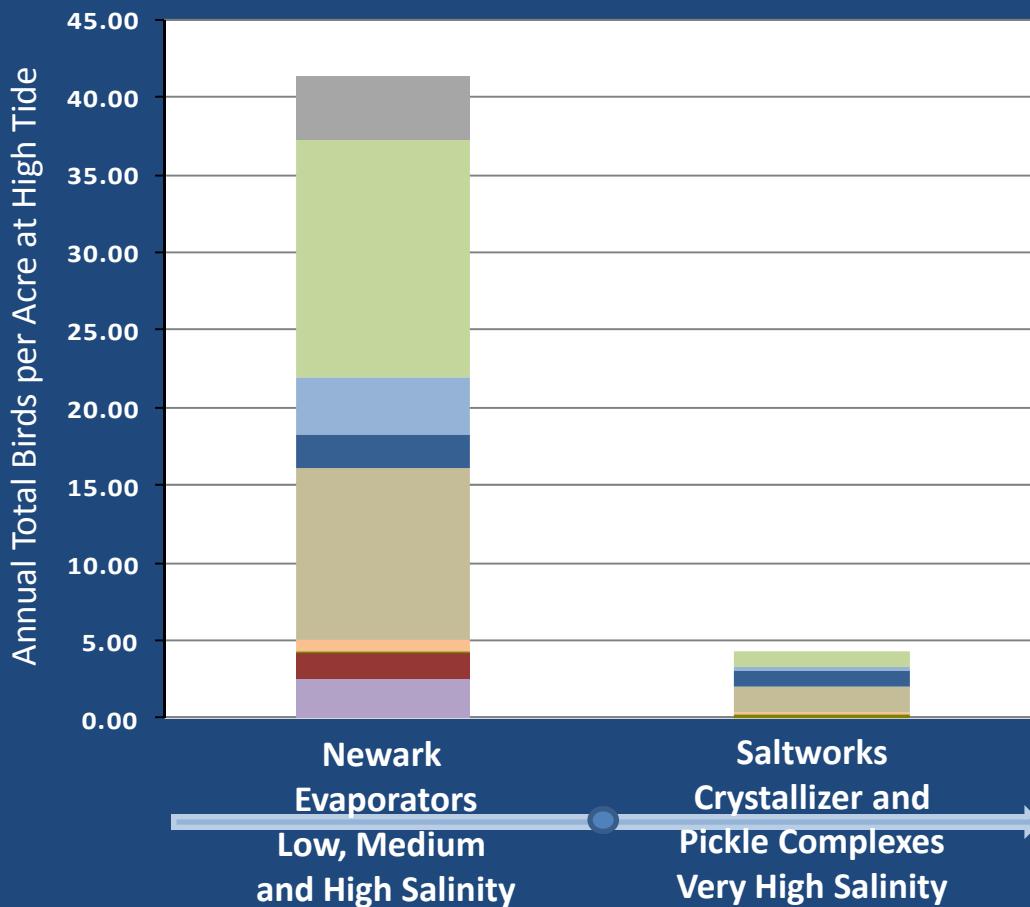
Annual Bird Density for Evaporators and Saltworks



Salt Production Facility

Tidal Marsh
Salt Evaporators
Salt Production Facility

Annual Bird Density for Evaporators vs. Pickle and Crystallizers



- Eared Grebe & Phalaropes
- Gulls
- Large Shorebirds
- Medium Shorebirds
- Small Shorebirds
- Fish Eaters
- Canada Goose
- Diving Ducks
- Dabblers (Ducks & Coot)

Wildlife Diversity/Abundance

Birds

Fish

Mammals

Reptiles

Amphibians

Invertebrates

Salt Production Facility

WET Wildlife Functions and Services In Salt Production Cells

Wildlife	Ecological Function for Wildlife
Birds	LOW
Fish	NONE
Mammals	NONE
Reptiles	NONE
Amphibians	NONE
Invertebrates	LOW-NONE

Ground Water Recharge
Ground Water Discharge
Flood Flow Alteration
Sediment Stabilization
Sediment/Toxicant Retention
Nutrient Retention
Production Export
Aquatic Diversity/Abundance
Wildlife Diversity/Abundance
Birds
Fish
Mammals
Reptiles
Amphibians
Invertebrates
Recreation
Uniqueness/Heritage

Quantifying Functions and Services

Methods to Quantify Functions and Services

Numeric Wetland Evaluation Technique (WET)

- Midpoints assigned to rating categories on a 0 – 100 scale
- Functional Capacity Index calculated as Mean Score x Acreage

Hydrogeomorphic Assessment (HGM)

- Based on National Guidebook for Tidal Fringe Wetlands
- Functional Capacity Index calculated as Score x Acreage
- Total Functional Capacity Index is the sum of each HGM metric

Evaluation for Planned Wetlands (EPW)

- Flexible across habitat types; based on HGM, HEP and WET
- Functional Capacity Index calculated as Score x Acreage
- Total Functional Capacity Index is the sum of each EPW metric

Wetland Evaluation Technique (WET)

Ecological and Cultural Services

Ecological

- Ground Water Recharge
- Ground Water Discharge
- Flood Flow Alteration (Flood Storage)
- Sediment Stabilization
- Sediment/Toxicant Retention
- Nutrient Removal/Transformation
- Production Export
- Aquatic Diversity/Abundance
- Wildlife Diversity/Abundance

Cultural

- Recreation
- Uniqueness/Heritage

WET: Aquatic Resource Functions

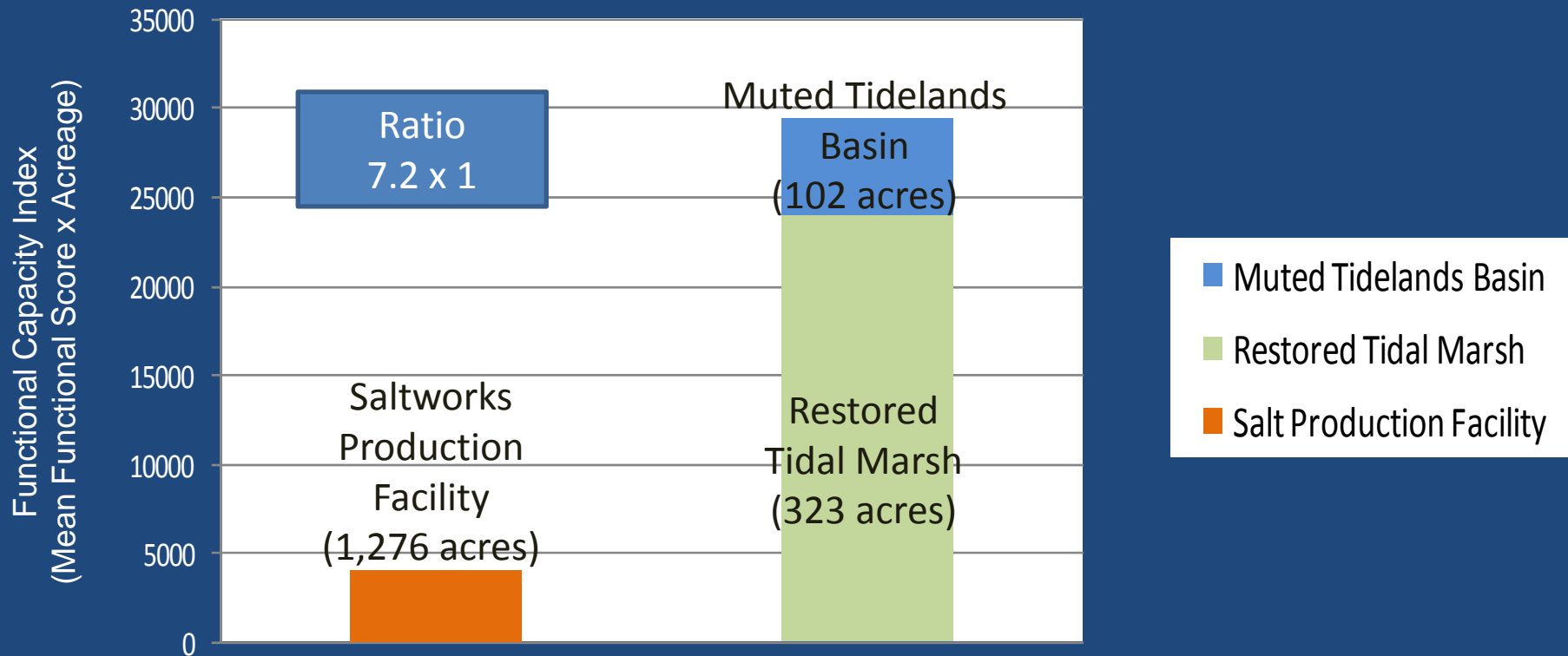
Numeric WET Analysis

(Midpoints Low = 17.5, Moderate = 49.5, High = 89.5)

Aquatic Resource Function		Restored Tidal Marsh	Muted Tidelands Basin	Evaporators			Salt Production Facility
				Low Salinity	Medium Salinity	High Salinity	
ECOLOGICAL	Ground Water Recharge	17.5	49.5	17.5	17.5	0	0
	Ground Water Discharge	49.5	49.5	17.5	0	0	0
	Floodflow Alteration	83.5	83.5	0	0	0	0
	Sediment Stabilization	83.5	83.5	17.5	17.5	0	0
	Sediment/Toxicant Retention	83.5	83.5	49.5	17.5	0	0
	Nutrient Removal/ Transformation	83.5	83.5	49.5	17.5	0	0
	Production Export	83.5	49.5	0	0	0	0
	Aquatic Diversity/Abundance	83.5	17.5	17.5	0	0	0
	Wildlife Diversity/Abundance	83.5	49.5	49.5	49.5	17.5	17.5
CULTURAL	Recreation	83.5	17.5	49.5	49.5	0	0
	Uniqueness/Heritage	83.5	17.5	17.5	17.5	17.5	17.5
Mean Functional Score		74.4	53.1	26.0	17.0	3.2	3.2

WET: Relative Aquatic Functions

Numeric WET



Hydrogeomorphic Assessment (HGM)

Corps Developed Methodology

Designed to provide a quantitative comparison
(Functional Capacity Index)

Evaluation based on National Guidebook for
Application of Hydrogeomorphic Assessment to
Tidal Fringe Wetlands

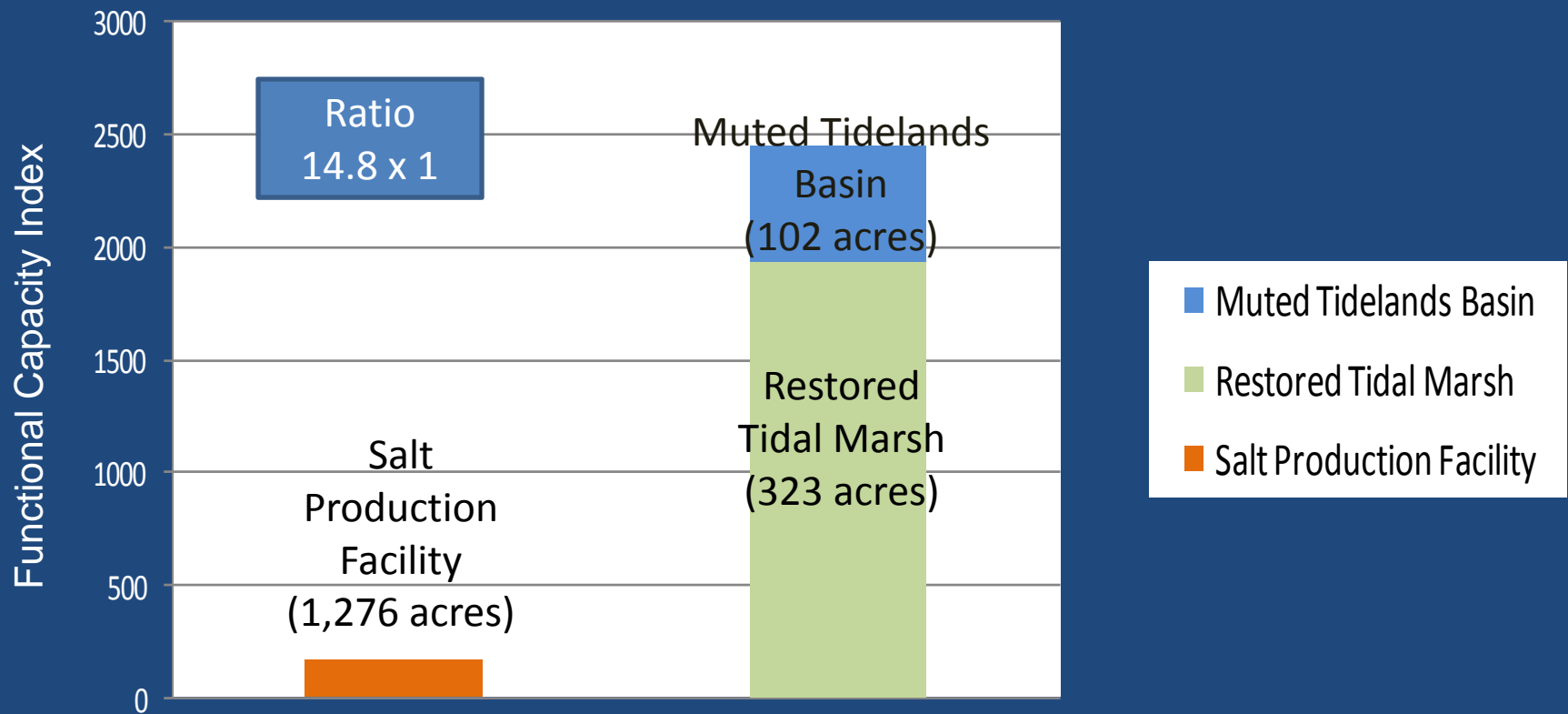
HGM: Aquatic Resource Functions

HGM: Salt Production Facility and Restored Habitats

	Saltworks Salt Production Facility			Restoration Area					
				Restored Tidal Marsh			Muted Tidelands Basin		
Function Evaluated	HGM Score	Acres	Functional Capacity Index	Projected HGM Score	Acres	Functional Capacity Index	Projected HGM Score	Acres	Functional Capacity Index
Tidal Surge Attenuation	0	1276	-	0.26	323	84.0	0.25	102	25.5
Sediment Deposition	0	1276	-	0.68	323	219.6	0.69	102	70.4
Tidal Nutrient and Organic Carbon Exchange	0	1276	-	0.96	323	310.1	0.88	102	89.8
Characteristic Plant Community Composition	0	1276	-	0.53	323	171.2	0.26	102	26.5
Resident Nekton Utilization	0	1276	-	0.97	323	313.3	0.89	102	90.8
Nonresident Nekton Utilization	0	1276	-	0.99	323	319.8	0.79	102	80.6
Nekton Prey Pool	0	1276	-	0.95	323	306.9	0.73	102	74.5
Wildlife Habitat Utilization	0.13	1276	165.9	0.67	323	216.4	0.52	102	53.0
Total		1276	166	Total	323	1,941	Total	102	511
Total per Acre			0.13	Total per Acre		6.01	Total per Acre		5.03

HGM: Relative aquatic functions

HGM: Saltworks and Restored Habitats Aquatic Resource Functions



EPW: Aquatic Resource Functions

Evaluation for Planned Wetlands (EPW)

Integrates several methods, including HGM, HEP, and WET

Demonstrated use in determining appropriate Section 404 mitigation

Designed to provide a quantitative comparison (Functional Capacity Units)

Sufficient background studies are available on comparative wildlife utilization to allow EPW evaluation of wildlife values

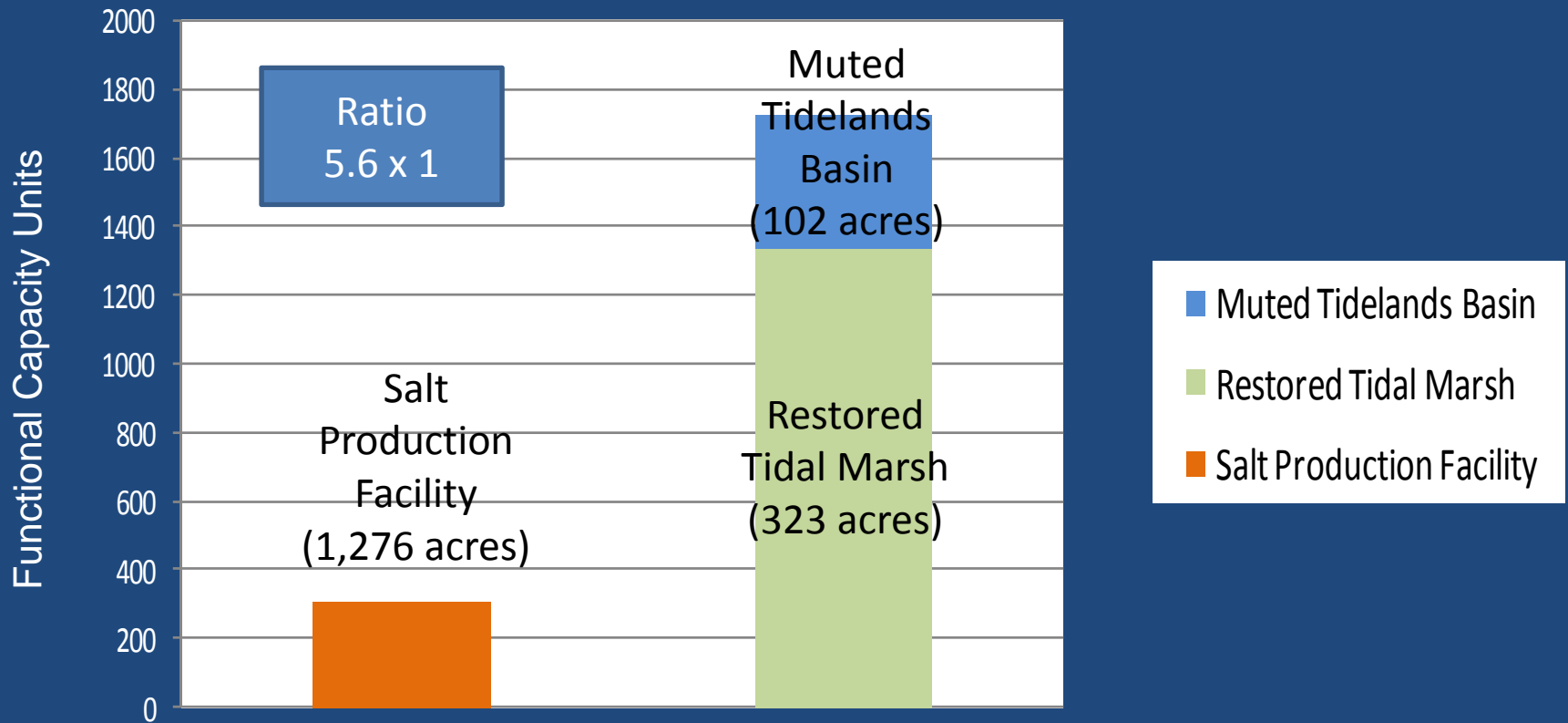
EPW: Functions and Services

EPW: Salt Production Facility and Restored Habitats

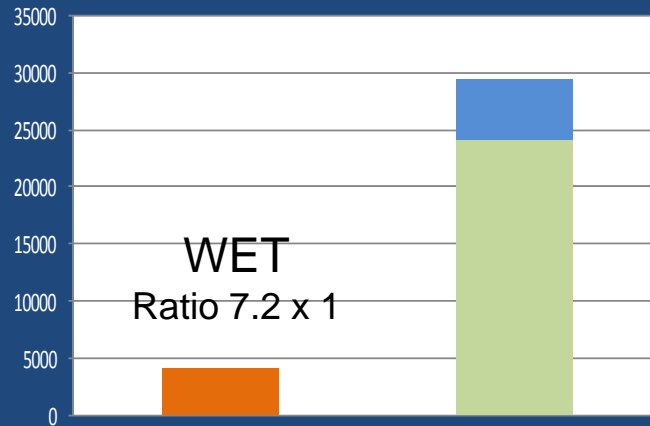
	Saltworks Salt Production Facility			Restoration Area					
				Restored Tidal Marsh			Muted Tidelands Basin		
Function Evaluated	Functional Capacity Index	Acres	Functional Capacity Units	Predicted Functional Capacity Index	Acres	Target Functional Capacity Units	Predicted Functional Capacity Index	Acres	Target Functional Capacity Units
Shoreline Bank Erosion Control	NA	1276	-	0.94	323	303.6	0.86	102	87.7
Sediment Stabilization	0.09	1276	114.8	1.00	323	323	0.86	102	87.7
Water Quality	NA	1276	-	1.00	323	323	0.91	102	92.8
Wildlife	0.15	1276	191.4	0.57	323	184.1	0.57	102	58.1
Tidal Fish	NA	1276	-	0.61	323	197.0	0.6	102	61.2
Non-tidal Stream/River	NA	1276	-	NA	323	-	NA	102	-
Non-tidal Pond/Lake	NA	1276	-	NA	323	-	NA	102	-
Total		1276	306	Total	323	1,331	Total	102	388
Total per Acre			0.24	Total per Acre		4.12	Total per Acre		3.80

EPW: Relative aquatic functions

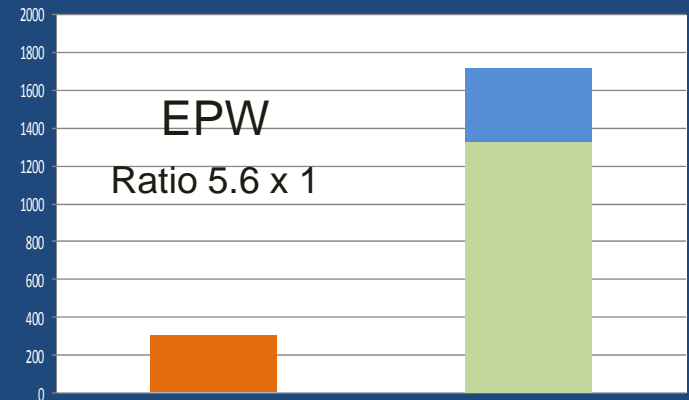
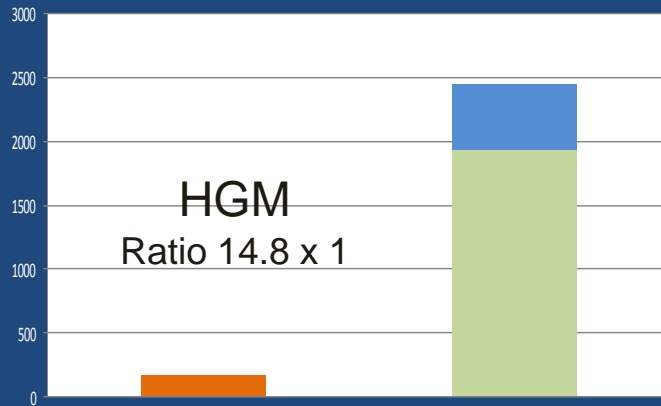
EPW: Saltworks and Restored Tidal Marsh Functions and Services



Aquatic Resource Functions Comparison



- Restored Tidal Marsh (323 acres)
- Muted Tidelands Basin (102 acres)
- Salt Production Facility (1,276 acres)



Summary Compensatory Mitigation Functional Analysis

Corps Mitigation Regulations

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